

Appl. No. 09/923,720
Amdt. Dated January 13, 2004
Reply to Office Action of October 14, 2003

CLAIM AMENDMENTS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

1 (currently amended): A test apparatus for testing at least one semiconductor integrated circuit having a group of contact areas defining a wafer surface profile, the test apparatus comprising:

a chuck for holding a wafer that has at least one semiconductor integrated circuit with a group of contact areas that define a wafer surface profile;

a test head that is configured opposite said chuck and that includes a performance board;

a probe card that is configured on said test head and that has contacts for making contact with the contact areas of the integrated circuit, said contacts having areas that are intended to come into contact with the contact areas of the integrated circuit and that define a test surface profile;
and

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at least three actuators electrically driven to change length according to an electrical signal, said at least three actuators being ~~that~~ are configured on said probe card for aligning the test surface profile parallel with the wafer surface profile prior to the test surface profile contacting the wafer surface profile, said actuators also ~~for~~ changing a distance between said performance board and said contacts of said probe card in a direction substantially orthogonal to the wafer surface profile.

2 (original): The test apparatus according to claim 1, wherein said actuators are configured between said performance board and said probe card and are connected to said performance board and said probe card.

3 (canceled).

4 (original): The test apparatus according to claim 2, wherein said probe card is made from a material that is capable of flexibly following movements of said actuators.

5 (previously presented): The test apparatus according to claim 1, wherein:

said probe card includes a substrate; and

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said actuators are configured in said probe card and are
connected to said contacts of said probe card and to said
substrate.

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6 (original): The test apparatus according to claim 1,
wherein:

the wafer has a plurality of groups of contact areas; and

said probe card includes a plurality of partial cards that
are separated from each other and that each include ones of
said actuators to adapt to a number of the plurality of the
groups of the contacts on the wafer.

7 (original): The test apparatus according to claim 1,
wherein said actuators are selected from the group consisting
of piezoelectric elements, hydraulic elements, and
electromechanical elements.

8 (original): The test apparatus according to claim 1,
wherein:

said performance board is a circuit board having a first
group of contacts in a first predefined configuration for
making contact with evaluation and control electronics; and

said performance board has a second group of contacts in a
second predefined configuration for making contact with said
probe card.

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9 (original): The test apparatus according to claim 8, wherein said probe card has contacts for making contact with said second group of said contacts that are on said performance board.

10 (original): The test apparatus according claim 1, wherein said probe card includes distance sensors capable of determining a distance to the wafer at various points.

11 (original): The test apparatus according to claim 1, wherein said probe card has a device for storing and outputting an identification number.

12 (original): The test apparatus according to claim 1, wherein said probe card has test circuits for applying coordinated signals to the wafer, the signals are selected from the group consisting of test signals and test signal sequences.

13 (original): The test apparatus according to claim 1, wherein:

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said probe card includes distance sensors for outputting signals indicating distances between said sensors and the wafer; and

said probe card includes a control device for evaluating the signals that are output by said distance sensors, said control device also for driving said actuators.

14 (original): The test apparatus according to claim 1, wherein said probe card includes a component that is selected from the group consisting of a wafer and parts of a wafer.

15 (original): The test apparatus according to claim 14, wherein said contacts of said probe card are a constituent part of said component.

16 (original): The test apparatus according to claim 14, comprising a second wafer that is configured between said probe card and said performance board, said actuators are configured on said second wafer.

17 (withdrawn): A method of testing semiconductor circuits in a test apparatus, which comprises:

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providing a wafer that has at least one semiconductor integrated circuit with a group of contact areas that define a wafer surface profile;

providing a test apparatus that includes a chuck for holding the wafer;

providing the test apparatus with a test head that is configured opposite the chuck and that includes a performance board;

providing the test apparatus with a probe card that is configured on the test head and that has contacts for making contact with the contact areas of the integrated circuit;

providing the contacts with areas that are intended to come into contact with the contact areas of the integrated circuit and that define a test surface profile;

providing the probe card with actuators;

using the actuators to align the test surface profile parallel with the wafer surface profile; and

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using the actuators to enlarge a distance between the performance board and the contacts in a direction substantially orthogonal to the wafer surface profile until the contacts of the probe card have produced an electrical connection with the contact areas of the wafer.

18 (withdrawn): The method according to claim 17, which comprises performing the step of using the actuators to enlarge the distance between the performance board and the contacts until a moment selected from the group consisting of when the contacts have scratched into surfaces of the contact areas and when the contacts have penetrated an oxide layer.

19 (withdrawn): The method according to claim 17, which comprises before performing the alignment step, moving the chuck and the wafer toward the probe card such that there is a predefined distance between the wafer and probe card.

20 (withdrawn): The method according to claim 17, which comprises permanently registering a distance between the probe card and the wafer.

21 (withdrawn): The method according to claim 17, which comprises performing the alignment step by tilting the probe card in relation to the wafer.

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22 (withdrawn): The method according to claim 17, which comprises performing the alignment step by bending the probe card to form a required surface profile.

23 (withdrawn): The method according to claim 17, which comprises performing the alignment step by setting a common distance between the contacts and the contact areas that are to be contacted.

24 (withdrawn): The method according to claim 23, which comprises:

performing the step of providing the probe card with actuators by providing an actuator for each one of the contacts; and

setting the common distance by using the actuators to change positions of individual ones of the contacts.

25 (withdrawn): The method according to claim 17, which comprises performing the step of using the actuators to enlarge the distance between the performance board and the contacts by extending all of the actuators uniformly.

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26 (withdrawn): The method according to claim 17, which comprises vibrating or oscillating the contacts, at least during the step of enlarging the distance between the performance board and the contacts.

27 (previously presented): The test apparatus according to claim 1, wherein the at least three actuators includes a first set of global actuators to compensate for global tilting of the wafer or the chuck and a second set of dedicated actuators, one dedicated actuator for each of the contacts on the probe card, to individually move the associated contact relative to the probe card, wherein the dedicated actuators are configured on the probe card for aligning the contacts of the probe card parallel with the contact areas of the integrated circuit before the contacts of the probe card contact the contact areas on the integrated circuit.